

## Evaluation of the antioxidant properties of spices by cyclic voltammetry

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### Abstract

© 2014, Pleiades Publishing, Ltd. The individual antioxidants of spices (gallic and rosmarinic acids, capsaicin, thymol, and eugenol) are irreversibly oxidized at 0.88–1.25 V at a glassy carbon electrode in 0.1 M LiClO<sub>4</sub> solution in ethanol. Corresponding electrode reactions are proposed. A linear dependence of the oxidation step area on the concentration is observed for all the analytes. The detection limits and the lower limits of quantification vary from 0.57–12 and 1.8–40 μM, respectively. Distinct steps and peaks of oxidation are observed on cyclic voltammograms of the methanolic extracts of spices; the potentials and areas of these peaks depend on the type of spice. The contribution of individual antioxidants to integral responses of spice extracts is evaluated. A method is developed for the voltammetric evaluation of the antioxidant capacity (AOC) of spices based on the oxidation of their antioxidants. The total area of the oxidation steps was selected as a parameter characterizing the antioxidant properties. The AOC of spices was expressed as a weight of gallic acid in milligrams per 1 g of a dry spice. Seventeen different spices were tested. The AOC decreases in the series of clove > juniper berries > nutmeg > cinnamon > rosemary > anise ≥ oregano > black pepper ≥ ginger ≥ basil > turmeric > red pepper ≈ bay leaf ≥ coriander ≈ red sweet pepper > cumin > caraway. A correlation between the AOC obtained by voltammetry and the total AOC, ferric reducing power, antiradical activity, and total content of phenolic compounds and these parameters with each other is found; the correlation coefficients vary in the range 0.8886–0.9615.

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### Keywords

antioxidant properties, cyclic voltammetry, food analysis, galvanostatic coulometry, phenolic antioxidants, spices